

CLAIMS

1. A negative electrode material for lithium secondary batteries, the negative electrode material being capable of storing and emitting lithium ions, comprising:

a basic material particle including one of a phase A having silicon as a main component, and a mixed phase of a phase B including an intermetallic compound of a transition metal element and silicon and the phase A, the phase A and the mixed phase being microcrystalline or amorphous,

a carbon material adhered to a part of a surface of the basic material particle, and

a film having a silicon oxide, the film being formed on a surface portion of the base material particle, the surface portion being other than a surface portion to which the carbon material is adhered.

2. The negative electrode material for lithium secondary batteries according to claim 1:

wherein the carbon material is graphite capable of storing and emitting lithium ions.

3. The negative electrode material for lithium secondary batteries according to claim 1:

wherein the carbon material is fibrous.

4. The negative electrode material for lithium secondary

batteries according to claim 1:

wherein the amount of the film is at least 0.1 wt% and at most 1.0 wt% per silicon element in terms of oxygen amount.

5 5. The negative electrode material for lithium secondary batteries according to claim 1:

wherein an adhesion amount of the carbon material is at least 1.9 % and at most 18 wt%.

10 6. A negative electrode for lithium secondary batteries comprising the negative electrode material of any one of claims 1 to 5.

7. A lithium secondary battery comprising:
15 the negative electrode of claim 6,
 a positive electrode capable of storing and emitting lithium ions, and
 an electrolyte interposed between the negative electrode and the positive electrode.

20 8. A manufacturing method of a negative electrode material for lithium secondary batteries, the negative electrode material being capable of storing and emitting lithium ions, comprising steps of:

25 A) forming a basic material particle including one of a phase A having silicon as a main component, and a mixed phase of a phase B including an intermetallic compound of a transition metal element

and silicon and the phase A, the phase A and the mixed phase being microcrystalline or amorphous,

B) adhering a carbon material to at least a part of a surface of the basic material particle, and

5 C) covering a surface portion of the base material particle by a film having a silicon oxide, the surface portion being other than a surface portion to which the carbon material is adhered.

9. The manufacturing method of the negative electrode material
10 for lithium secondary batteries according to claim 8:

wherein the step A is performed using a vibration mill machine.

10. The manufacturing method of the negative electrode material for lithium secondary batteries according to claim 8:

15 wherein the step A and the step B are continuously performed using a vibration mill machine.